SHALLOW ICY DECOLLEMENTS ON MARS: RHEOLOGICAL EVIDENCE - PRELIMINARY RESULTS. N. Mangold[1], P. Allemand[1], P. Thomas[1], and P. Duval[2], [1]Laboratoire des Sciences de la Terre, UMR 5570, Ecole Normale Superieure, 46 allée d'Italie 69364 Lyon, France, [2]Laboratoire Glaciologie et Geophysique de l'Environnement, BP 96, 38402 St Martin D'Heres, France.

The wrinkle ridges of Mars are long and narrow positive topographies. Structural evidence suggests that these structures are bounded by thrusts rooted on a shallow décollement level. This décollement level is located inside the ice-rich megaregolith. In order to test the mechanical contribution of ice on the occurrence of décollement level, rheological tests have been done on samples equivalent to the martian megaregolith in martian thermodynamical conditions. Rheological parameters have been determined by deformation tests in a triaxial cell driven by a hydraulic press located in a cold room. Applied physical parameters are typical from the underground of Mars: –5° to –25°C and 5 to 30 MPa of lithostatic pressure.

The sample of ground ice simulating the ice megaregolith mixing is composed by a porous granular medium (sand or silt) saturated by water ice. Porosity is take between 20 and 50% of the total volume depending on granulometry. First runs were made at constant porosity (47%) and temperature (–10°C) to establish the deformation law of the sample at different confining pressures. The observed behavior is analogous to the viscoplastic behavior of pure ice following a power law creep with an exponent $n \simeq 3$. Nevertheless we observed that (1) the mixing creeps slower than pure ice, and (2) the effect of confining pressure is important. Indeed under the same differential stress of 6 to 10 MPa the sample under 5 MPa of confining pressure is deformed faster than the sample under 12 and 19 MPa. This behavior is due to the development of microcracking, which does not develop under higher confining pressure.

Second type of runs were made at different porosities. A low diminution of the porosity under 50% has important effect on the steady-state strain rates. At the same differential stress dense rock mixing (porosity lower than 30%) deforms by fracturation while ice-rich mixing (porosity higher than 30%) deforms by creep. The nature of the sand grains and the granulometry are also important parameters. Taking into account models of temperature, porosity, and pressure the implications of these results are summarized in a strength profile of the upper martian crust. This profile shows the possibility to have ice-rich ductile levels.